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| **Lesson Title:** I can construct equations |
| **Subject area / course / grade level:**  **Pre -Algebra / Math / Grade 6** |
| **Introduction:** The purpose of this lesson is to link students’ knowledge of basic addition facts to the application of simple addition equations found in the algebra curriculum. Integrating students’ knowledge of variables in equations using a manipulative, students will learn to recognize when to apply addition equations to resolve problems when constructing models. Students will determine how to interpret and assess given situations that require them to devise equations to solve real-life problems. |
| **Lesson Length:**  **45 minutes** |
| **Materials:** Jenga blocks, pencil, paper, overheads, model of Brooklyn Bridge, graphic organizer, glue, tape, ruler, textbooks, math notebooks |
| **Lesson Overview:** Students will begin lesson by discussing professions that rely on mathematical equations to complete their daily work such as engineers, architects, and builders as well as daily, real-life situations that require equations. A hands-on activity will require students to identify a problem, devise a solution using a variable and an addition equation, and generate a solution. |
| **Tennessee Standards:**  GLE 0606.3.2 Interpret and represent algebraic relationships with variables in  expressions, simple equations and inequalities.  GLE 0606.3.4 Use expressions, equations and formulas to solve problems.  GLE 0606.3.5 Use multiple representations including symbolic algebra to  model and/or solve contextual problems that involve  linear relationships.    Grade 6 - SPI 0606.3.3 Write equations that correspond to given situations  or represent a given mathematical relationship.  - SPI 0606.3.5 Translate between verbal expressions/sentences  and algebraic expressions/equations.  - SPI 0606.3.6 Solve two-step linear equations using number sense,  properties, and inverse operations. |
| **Lesson objective/outcome(s):**  **TLW:** Students will recognize and assess problems using a scale model and formulate addition equations to determine how to generate a solution. Students will explain how they devised their solutions using appropriate algebraic vocabulary. |
| **ENGAGE**   * How will the teacher capture students’ interest? * What kind of questions should the students ask themselves after the engagement?   Teacher will begin a short inquiry-based discussion with students regarding careers and daily, real-life situations that require mathematical equations. For example, “Why would an architect or engineer in charge of building your school need to use math? What might happen if he or she did not use equations to know how many blocks are needed to complete the project? Would you want to drive or walk across a bridge if the builders did not calculate how much concrete was needed to finish the project safely and support the weight of cars and people?” Refer students to page 70 in their texts to the example of the surfer and remind them of the practical application of an addition equation for both the consumer (surfer) and a surf shop owner (expert).  After the discussion, students should be thinking of situations and asking themselves and each other what types of situations require math to solve problems or successfully complete simple and complicated tasks. |
| **EXPLORATION**   * What hands-on/minds-on activities will students be doing? * What are the “big idea” conceptual questions that the teacher will use to encourage and/or focus students’ exploration?   **Hands-on/Minds-on Activities:**  Working in small teams as architects and engineers, students will receive graphic organizers and models of the Brooklyn Bridge with instructions that they are employed by the City of New York to rebuild the bridge after the city demolishes it because of age and the expense of restoration. (Social studies note: project this site for bridge background: http://www.aviewoncities.com/nyc/brooklynbridge.htm) Each team’s model has problems. Students will not be able to construct the bridge correctly without using a ruler and an addition equation to determine the missing pieces needed to finish the model. Students are given five minutes to attempt to construct the bridge and identify their missing pieces. They begin the problem-solving process by documenting their observations on their organizers and hypothesizing what materials are needed to complete their bridges.  **Big –Idea Questions include:**   1. What is missing from the model? 2. How can we use an addition equation to find how much material is needed? 3. How do we determine the variable in the equation? 4. Why is it important to use inverse operations to solve our model’s problems?   **At-Home Exploration:**  With teacher or parent supervision and permission, students will find additional equation practice and mathematical information at these sites:  http://mathcentral.uregina.ca/index.php  http://www.softschools.com/  \*http://www.sheppardsoftware.com/mathgames/mathman/mathman.htm  \*Mathman is a game of Pacman with numerical ghosts. The Mathman can only eat the ghosts that represent the answer to the equations Mathman unlocks and eats. |
| **EXPLANATION**   * Student explanations should precede introduction of terms or explanations by the teacher. What questions or techniques will the teacher use to help students connect their exploration to the concept under examination? * List higher order thinking questions, which teachers will use to solicit *student* explanations and help them to justify their explanations.   Review page 71 of the text, the distance problem and example 2 on page 72. Teacher will model a similar problem to that of the students’ bridges using Jenga blocks, giving students an opportunity to manipulate the blocks as time allows, posing a construction problem and solving addition equations to find missing materials needed to complete the constructions. Teacher will use scaffolding techniques with the graphic organizer while modeling addition equations with Jenga blocks.  Students will refer to their math notebooks for a vocabulary review, making sure inverse operations are added to the vocabulary math wall.  **Big –Idea Questions include:**   1. What is missing from the model? 2. How can we use an addition equation to find how much material is needed? 3. How do we determine the variable in the equation? 4. Why is it important to use inverse operations to solve our model’s problems? 5. What vocabulary needs to be added to the math wall? |
| **ELABORATION**   * Describe how students will develop a more sophisticated understanding of the concept. * What vocabulary will be introduced and how will it connect to students’ observations? * How is this knowledge applied in our daily lives? * Students will create and write problematic questions that require algebraic expressions such as addition equations to solve. They will devise situations where a problem occurs and write steps to take when solving the problem. * Students will list at least three times each day they use mathematical operations in their daily lives.     **Vocabulary:**  equation, expression, input, order of operations, output, pattern, reasoning, single-step, symbols, unknown, variables, inverse operations |
| **EVALUATION**   * How will students demonstrate that they have achieved the lesson objective? * This should be embedded throughout the lesson as well as at the end of the lesson   Students will return to their groups and the construction of their Brooklyn Bridge models. Using the examples from class, students should possess the necessary background knowledge to formulate addition equations to determine the size of the missing pieces to their bridges.   * Students formulate addition equations to determine sizes of missing pieces. * Students locate missing pieces from the “supply yard,” an assortment of pieces on a worktable. Students will need rulers to measure pieces. * Students complete their graphic organizers by writing the equations needed for their models and a written explanation of the steps taken to solve their models’ problems. * Teacher evaluates the performance-based assessment of the graphic organizer and completed models, checking for student understanding of the lesson. |

**NOTES:**